

# *Pisidium chiquitanum* new species from Santa Cruz de la Sierra, Bolivia (Bivalvia: Sphaeriidae)

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## ABSTRACT

A new species of *Pisidium* C. Pfeiffer, 1821, from Santa Cruz de La Sierra, Bolivia, is here described. *Pisidium chiquitanum* new species is defined by the striking ovate shell outline, backward displaced beaks, enclosed ligament pit, and by the presence of two siphonal apertures and two demibranchs on each side.

*Additional key words.* South America, freshwater, bivalve, clam.

## INTRODUCTION

Little is known about the species of the genus *Pisidium* C. Pfeiffer, 1821, in Bolivia. At present, only two species have been reported from that country: *Pisidium mcierbrooki* Kuiper and Hinz, 1984, described from a pond at 4100 m altitude at Cordillera de los Frailes (19°34' S, 65°45' W, eastern Potosí, Bolivia), also reported from Nubi Lake (15° S, 69° W) at 4600 m altitude, near Ulla Ulla, and *Pisidium vile* Pilsbry, 1897, recently reported from Estación Parapetí, Santa Cruz de la Sierra (Ituarte, 1995).

The species originally described as *Pisidium* (*Pisidium*) *titicacense* Pilsbry, 1924, and *Pisidium bolivicense* (Sturany, 1900) actually belong to the genus *Sphaerium* Scopoli, 1777 (Kuiper and Hinz, 1984). Additionally, *Cyclas forbesi* (Philippi, 1869) was erroneously cited by Pilsbry, 1911, as a *Pisidium* species. *Pisidium chiquitanum* new species from Santa Cruz de la Sierra, Bolivia, is described in the present work.

## MATERIALS AND METHODS

The source of material is described in the systematics section. The specimens were fixed immediately after collection in 80% ethanol. Specimens for scanning electron microscopy were cleaned by repeated rinsing in distilled water followed by a short treatment (2–3 seconds) in a 10% sodium hypochlorite solution. For periostracum removal several specimens were treated with a concen-

trated solution of commercial sodium. Linear measurements (shell length (SL), shell height (SH), shell width (SW) and pre-siphonal suture (PSS)), morphometric indices and ratios (height index (HI = SH/SL), convexity index (Ci = SW/SH), ratio hinge length (HiL):shell length (HiL/SL)), were calculated according to the criteria followed by Ituarte (1996). For each calculation ( $n = 21$ ), mean and standard deviation values are given. For comparative purposes, specimens of *Pisidium magellanicum* (Dall, 1908) from the Princeton University Expedition to Patagonia lodged at the Academy of Natural Sciences of Philadelphia (ANSP) were used.

## SYSTEMATICS

*Pisidium chiquitanum* new species  
Figures 1–14

**Diagnosis:** Distinguishable by somewhat low and markedly oval shell shape, with low and backward located beaks, position of ligament, internal but externally visible, the presence of branchial and anal openings, two demibranchs on each side and nephridia of closed type.

**Description:** *Shell:* Thin, translucent, of small to medium size (mean SL =  $3.9 \pm 0.25$ , maximum observed size: 4.2 mm), not high (mean HI =  $80 \pm 1$ ), moderately convex (mean Ci =  $61 \pm 4$ ), shell outline markedly oval, elongate, anterior end produced in a sharp curve, posterior end short, widely rounded, sometimes slightly truncated and straight (figures 2, 3). Beaks low, slightly projected above dorsal margin, narrow, displaced backward, located at about 62% of SL. Shell surface finely and somewhat irregularly striated, dull glossy, straw-yellowish.

Hinge plate solid, hinge line rather long (HiL/SL =  $56 \pm 2$ ). Hinge: Right valve (figures 4, 5, 8): cardinal tooth (C<sub>r</sub>) strongly curved in the middle, quite narrow in anterior half, greatly enlarged in a weakly grooved, rounded cup. Lateral teeth robust, inner anterior lateral (AL) long, widely curved, cusp little displaced forward; outer anterior lateral tooth (AHL) quite short, cusp dis-

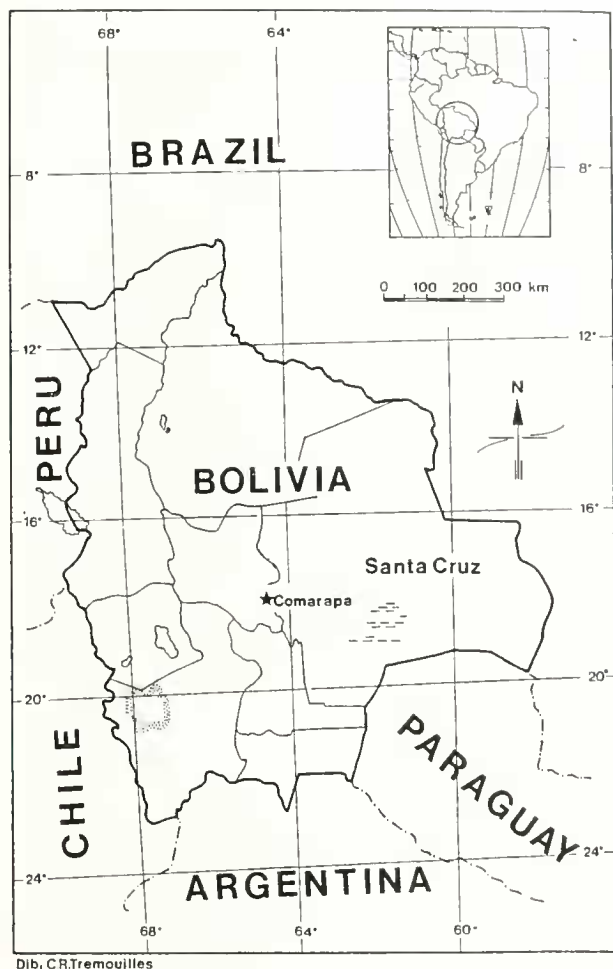


Figure 1. Location map. \*: Type locality.

tal: inner posterior lateral (PI) nearly straight, rather short, cusp sub-central; outer posterior lateral (PIII) reduced in size with distal cusp. Left valve (figures 6, 7): cardinal teeth short, the inner ( $C_2$ ) triangular, bent upward, slightly oblique in relation to antero-posterior axis, the outer ( $C_4$ ) a narrow, uniformly curved blade, quite oblique, overlapping  $C_3$  at posterior half; anterior lateral tooth (AII) strong, straight, cusp sub-central; posterior lateral tooth (PII) relatively short and weak, cusp distal. Ligament pit enclosed, deep, inner margin straight to slightly sinuous, concave at posterior end (figure 5). Es-cutecheon long, lanceolate, well marked by a delicate line (figure 9). Ligament long, strong, internal, even though visible, from outside, in anterior half through a very narrow, and in some cases rather long, gap between valves, never protruded (figures 9, 10). Ligament length is  $23 \pm 1\%$  of shell length.

**Anatomy:** Anal siphon and branchial inhalant opening present. Pre-siphonal suture rather long, representing  $11 \pm 2\%$  of SL (figure 13). The branchial inhalant opening is determined by a weak fusion of the inner mantle lobes, without muscular sphincter; a weak ventral re-

tractor muscle is present. Anal siphon well-developed, a pair of powerful siphonal retractors present (figure 13). Muscle scars (5 scars), corresponding to the inner radial mantle muscles, well marked, lying apart from the pallial line, those corresponding to anal siphon retractors coalescent with posterior adductor muscle scars (figure 11).

Inner and outer demibranchs present. Outer demibranch smaller, formed by 11–15 very short descending filaments, reaching back to the 14–16<sup>th</sup> filament of inner demibranch (figure 12). Brood pouches develop somewhat upward and posteriorly of inner demibranchs (however in contact with, or slightly covered by, the ascending lamella, which is well developed) (figure 14). Each brood pouch contains 3–4 embryos (embryonic shell length: 1.25–1.40 mm). Nephridia of closed type, dorsal lobe variable in shape, commonly subquadrate (figure 12), lateral loop not visible in dorsal view.

**Type locality:** Unnamed pond at "La Siberia", a site west of Comarapa, Manuel Caballero Province, Santa Cruz de la Sierra Department, Bolivia (figure 1); M. G. Cuezco coll.; 09/05/1997.

**Etymology:** The name refers to Chiquitos, aboriginal inhabitants of the lands presently known as "Llanos de Chiquitos" (central-eastern Bolivian plains), near the type locality.

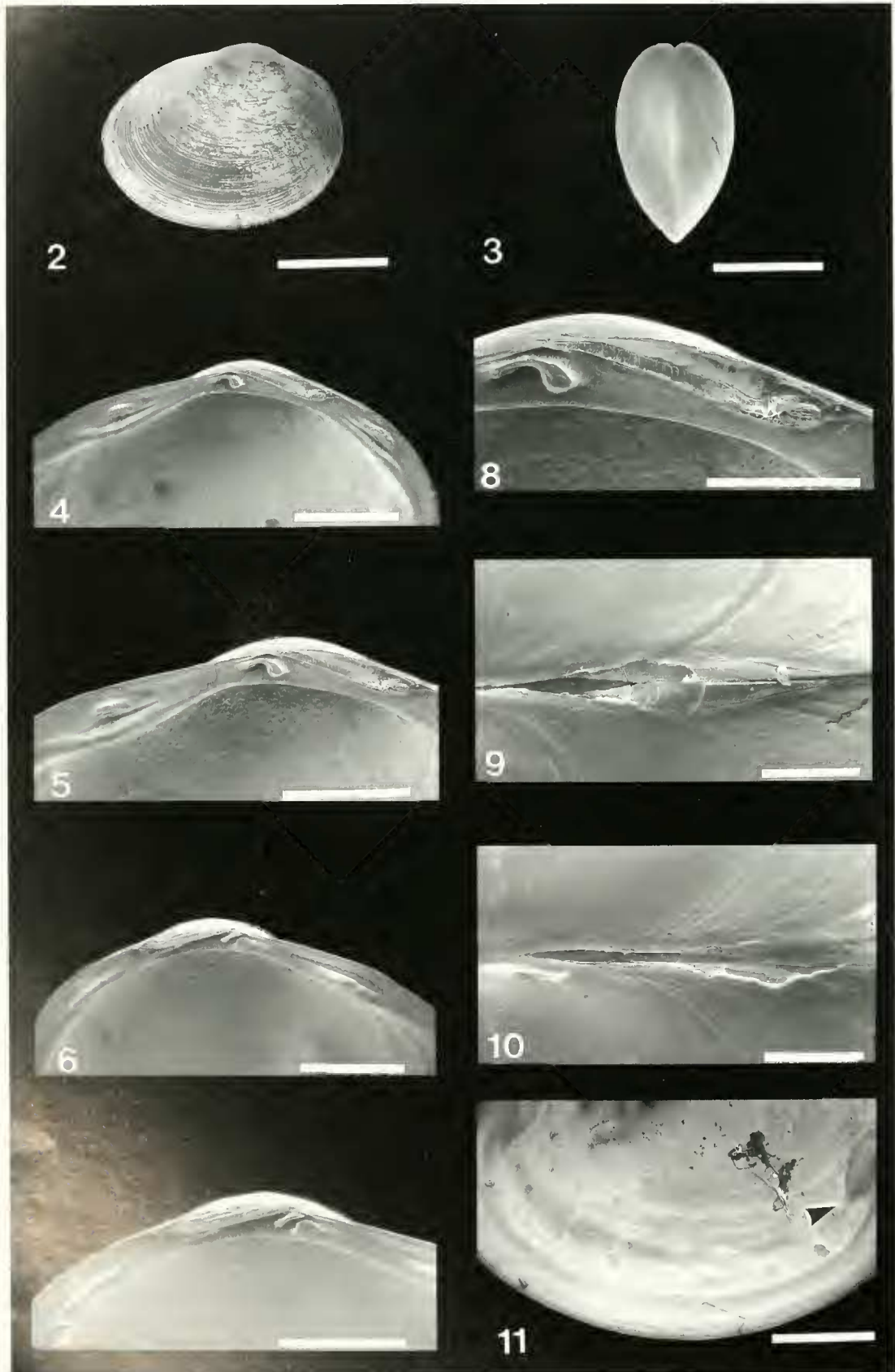
**Type material:** Holotype and paratypes in the malacological collection, Museo de Historia Natural "Noel Kempff Mercado", Santa Cruz de la Sierra, Bolivia (MHNB 34734). Other paratypes: Department of Invertebrates, Museo de La Plata (MLP 5362); Department of Invertebrates, Museo Argentino de Ciencias Naturales (MACN 34734); Fundación Instituto Miguel Lillo, Tucumán, Argentina (FIML 14235 and 14236); and Muséum national d'Histoire Naturelle, Paris (MNHN unnumbered).

## DISCUSSION

*Pisidium chiquitanum* new species can be easily identified among South American *Pisidium* species by its striking oval shell outline with low and narrow beaks and internal (however visible from exterior) ligament. The new species is also characterized by two, inner and outer demibranchs on each side, two siphonal openings and nephridia of closed type.

*Pisidium chiquitanum* new species resembles *Pisidium meierbrooki* Kuiper and Hinz, 1954 from Peru and Bolivia, which is the only known species from tropical South America with both, branchial and anal siphonal openings (Ituarte, 1995). *P. meierbrooki* differs from *P. chiquitanum* in having a more convex shell ( $Ci = 77-80$ ), fuller and more backward displaced beaks.

*Pisidium chiquitanum* new species is most similar to those specimens from Ecuador and Peru figured and reported by Kuiper and Hinz (1954) as *Pisidium casertanum* (Poli, 1791), a Eurasian species, extremely variable in shell shape and currently regarded as cosmopol-



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**Figures 2–11.** *Pisidium chiquitanum* new species. **2.** Holotype MHNB. **3–11.** Paratypes MLP 5362. **3.** Posterior view of a specimen. **4.** Hinge of a right valve. **5.** Right valve, detail of cardinal tooth, ligament and anterior lateral teeth. **6.** Hinge of a left valve. **7.** Left valve, detail of ligament, cardinal teeth, and posterior lateral tooth. **8.** Detail of cardinal tooth and ligament of a right valve. **9, 10.** Dorsal views of two specimens showing variability in shape and length of the gap between valves. **11.** Inner view of a right valve margin, showing scars of inner radial mantle muscles and anal siphon retractor (arrowhead). Scale bars: Figures 1–7, 11 = 1 mm; Figure 8 = 0.5 mm; Figures 9, 10 = 200  $\mu$ m.

itan (Burch, 1975; Kuiper, 1966, 1983; Kuiper and Hinz, 1984; Holopainen and Kuiper, 1982). However, these specimens are larger than *P. chiquitanum* new species (mean SL from measurements given by the authors was:  $4.51 \pm 1.31$  and maximum shell length: 7 mm), having more central beaks and less produced anterior end. Furthermore, *P. chiquitanum* new species differs from *P. casertanum* in being less convex, with lower and narrower beaks, decidedly located backward. Moreover, *P. chiquitanum* has a comparatively long pre-siphonal suture, being about 11–13% of the shell length, while *P. casertanum* has a shorter one comprising ca. 10% of shell length (Holopainen and Kuiper, 1982; Korniushin, 1996).

*Pisidium chiquitanum* new species shares with *Pisidium magellanicum* (Dall, 1908) the same siphonal arrangement, the type of nephridia and the number of demibranchs. However, *P. magellanicum*, the only *Pisidium* species from Argentinean and Chilean Patagonia known to have two siphonal openings and two demibranchs, differs from *P. chiquitanum* by the more central position of beaks (mean = 56%, range 53–58% of SL), shorter presiphonal suture, representing about 7.7% of shell length, and shorter ligament (mean = 19%, range: 18–20% of SL) (measurements and indices

are those reported by Iruarte (1996) and correspond to specimens of *P. magellanicum* from Río Chico, Santa Cruz Province, Argentina studied by Pilsbry (1911), which are part of lot SSS11 ANSP).

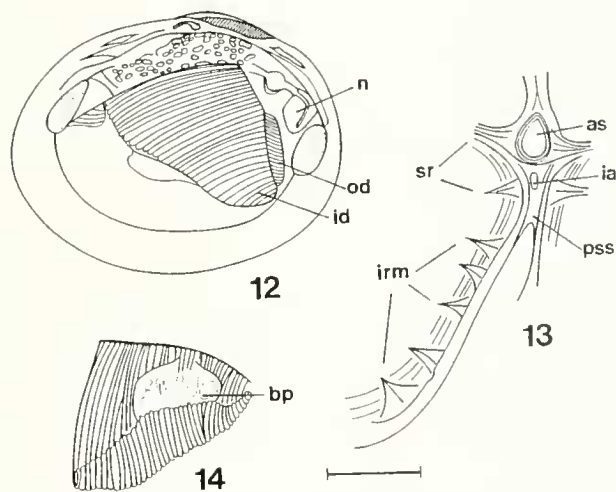
*Pisidium chiquitanum* new species chiefly differs from the group of species distributed along the drainages of southwestern Brazil, Uruguay, and northeastern Argentina (Iruarte, 2000) in having two demibranchs and two siphonal openings. Among those, *Pisidium sterkiannum* Pilsbry, 1897, a species widely distributed in central and northern South America, also differs from *P. chiquitanum* new species by an evidently external and protruded ligament, having a more inflated shell and nephridia of open type (Korniushin, 1995); *Pisidium dorbignyi* Clessin, 1879, from Uruguay and *Pisidium vile* Pilsbry, 1897, described from Uruguay and also distributed in Bolivia and Argentina, are much smaller species; *Pisidium pipoense* Iruarte, 2000, is larger than *P. chiquitanum* new species, having a marked subquadangular shell outline, while *Pisidium taraguayense* Iruarte, 2000, differs in having a larger and quite globose shell, with fuller beaks. *P. chiquitanum* new species differs from *Pisidium forense* Meier-Brook, 1967, from Minas Gerais, Brazil, by its smaller size, rounded shell outline, lower and less convex shell, and by having a more internal ligament.

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**Figures 12–14.** *Pisidium chiquitanum* new species. **12.** Gross anatomy. **13.** Mantle muscles. **14.** Inner view of inner demibranch. (bp: brood pouch; as: anal siphon; ia: inhalant aperture; id: inner demibranch; irm: inner radial mantle muscles; n: nephridium; od: outer demibranch; pss: presiphonal suture; sr: retractor muscles of siphonal openings). Scale bar: 1 mm.

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